REMARKS

The Examiner is thanked for the thorough examination of the present application. The Office Action, however, has tentatively rejected all claims. Reconsideration is respectfully requested in view of the above amendments and following remarks.

Applicants have made minor amendments to the specification to correct certain typographical inconsistencies. For example, the phrase "the patterned first photoresist layer" or "the first patterned photoresist layer" mentioned in the specification and the claims are amended to "the patterned photoresist layer" for the correction of typewriting errors. Also, the term "anti-reflective layer" mentioned in the specification and the claims are amended to "anti-reflective structure" for the correction of typewriting errors. Claims 1 and 10 have been amended to overcome the rejection(s) under 35 U.S.C 112. Moreover, claim 1 has incorporated the limitation recited in original claim 7, and 16 has incorporated the limitation recited in original claim 17 to more clearly identify one non-obvious aspect of claimed embodiments. Support for the amendment in claims 1 and 16 can be found in the figures and the specification of the present invention. Accordingly, no new matter has been added.

After entry of the foregoing amendments, claims 1-6, 8-16, and 18-20 remain pending.

Rejection under 35 U.S.C 102(b)

Turning now to the substantive rejections, claims 1, 3-4, and 6-8 were rejected under 102 (b) as allegedly anticipated by U.S. Patent No. 6,093,973 to Ngo et al.

Ngo et al. disclose a hard mask for metal patterning, which employs a substantially nitrogen free oxide layer disposed on the anti-reflective coating to adversely interact with a photoresist coating (see column 2, lines 40-45, and FIG. 3).

However, as amended, claim 1 defines the forming of a nitrogen-free silicon oxide layer having a refractive index of 1.4~1.7 and an extinction coefficient of 0~0.5 overlying the anti-reflective structure to serve as a protective layer. Ngo et al. do not teach or suggest the nitrogen-free silicon oxide layer has an extinction coefficient of 0~0.5.

Additionally, in section 4, the Office Action alleges that the nitrogen-free silicon oxide layer having a reflective index of 1.47 disclosed by Ngo et al. inherently has an extinction coefficient of 0. In fact, according to the well known optical formula: N*= n-ik (where N* is a complex reflective index, n is a reflective index (i.e. a real part of N*), and k is an extinction coefficient (i.e. an imaginary part of N*)), it is understood that the reflective index "n" and the extinction coefficient "k" are independent optical parameters to the complex reflective index "N*". Accordingly, a material having a reflective index (n) of 1.47 would not mean that the material inherently has an extinction coefficient (k) of zero.

Moreover, the reflective index "n" and the extinction coefficient "k" are related to the wavelength of the light passing through the material. For example, glass (SiO_2) has a reflective index of about 1.46 and an extinction coefficient of about 0 when visible light with a wavelength of about 633 nm passes through therein. Visible light, however, cannot be used as a light source for lithography. Thus, glass cannot have an extinction coefficient of about 0 when it is used in lithography.

Accordingly, since the cited reference wholly failes teach or suggest the nitrogen-free silicon oxide layer has an extinction coefficient of 0~0.5, claim 1 is allowable over the cited reference. Insofar as claims 2-9 depend from claim 1, those claims are also allowable.

Rejections under 35 U.S.C 103(a)

In section 5 (pages 4-5), the Office Action rejects claims 5 and 9 under 35 U.S.C 103(a) as allegedly unpatentable over Ngo et al. (U.S. 6,093,973) in view of Lee et al. (U.S. 6,376,392) and Xu et al. (U.S. 6,656,837). Moreover, at pages 5-6, claims 2 and 10-20 are rejected under 35 U.S.C 103(a) as being unpatentable over Ngo et al. (U.S. 6,093,973) in view of Lee et al. (U.S. 6,376,392) and Xu et al. (U.S. 6,656,837).

Ngo et al. , Lee et al., and Xu et al., standing alone or in combination, fails to disclose, teach, or suggest, inter alia, at least the following features recited by independent claim 10 of the present invention:

> "in-situ formation of a nitrogen-free silicon oxide layer having a refractive index of 1.4~1.7 and an extinction coefficient of 0~0.5 overlying a nitrogen-free dielectric anti-reflective structure to serve as a protective layer".

Instead, Ngo et al. disclose a hard mask for metal patterning, which employs a substantially nitrogen free oxide layer disposed on the anti-reflective coating to adversely interact with a photoresist coating (see column 2, lines 40-45, and FIG. 3). Lee et al. disclose a deposition process for silicon oxycarbide films based on plasma enhanced CVD, wherein films have excellent ARL properties with photoresist patterns formed on said films being free of overhangs and footings (see column 2, lines 30-37). Xu et al. disclose a method of eliminating photoresist poisoning in damascene applications, in which a silicon oxycarbide dielectric layer or a silicon carbide dielectric layer is deposited and treated its surface before depositing a photoresist material thereon, thereby limiting photoresist poisoning (see column 3, lines 21-34). However, neither Ngo et al. nor Lee et al and Xu et al. teach the above-quoted features of claim 10. For example, all of Ngo et al. , Lee et al., and Xu et al. wholly fail to suggest that "a

nitrogen-free silicon oxide layer having a refractive index of 1.4~1.7 and an extinction coefficient of 0~0.5", as recited by claim 10.

Under MPEP 2143, to establish a prima facie case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Since the cited references do not teach or suggest the above- quoted limitations of claim 10, Applicants respectively submits that claim 10 should be allowed. Claims 11-15 should also be allowed, at least by virtue of their dependency from claim 10.

Independent claim 16 also recites the above-quoted limitations. Thus, Applicants respectfully submits that amended claim 16 is patentable for at least the same reasons as claim 10. Claims 18-20 should also be allowed, at least by virtue of their dependency from claim 16.

Cite Art Made of Record

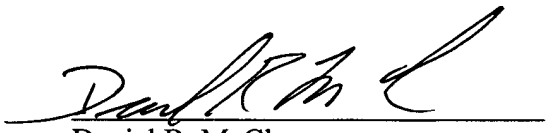
The cited art made of record, but not relied upon, is not believed to impact the patentability of the presently-pending claims.

CONCLUSION

In view of the foregoing, it is believed that all pending claims are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

No fee is believed to be due in connection with this amendment and response to Office Action. If, however, any fee is believed to be due, you are hereby authorized to charge any such fee to deposit account No. 20-0778.

Respectfully submitted,



Daniel R. McClure
Registration No. 38,962

THOMAS, KAYDEN, HORSTEMEYER & RISLEY, L.L.P.
Suite 1750
100 Galleria Parkway N.W.
Atlanta, Georgia 30339
(770) 933-9500